

02/20/01



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|--|--|---|---|
| FORM PTO-1390 (Modified)<br>REV 11-98  |  | U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE | ATTORNEY'S DOCKET NUMBER<br><b>0112740-153</b>                  |
| TRANSMITTAL LETTER TO THE UNITED STATES<br>DESIGNATED/ELECTED OFFICE (DO/EO/US)<br>CONCERNING A FILING UNDER 35 U.S.C. 371   |  |   | U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR)<br><b>09/763348</b> |
| INTERNATIONAL APPLICATION NO.<br><b>PCT/DE99/02513</b>   | INTERNATIONAL FILING DATE<br><b>11 August 1999</b> | PRIORITY DATE CLAIMED<br><b>14 August 1999</b>          |   |
| TITLE OF INVENTION<br><b>A Method For Optimizing The Transmission Properties and Power Loss of A High Voltage Part Integrated In A Subscriber Line Circuit For Connecting a Subscriber Line</b>  |  |   |   |
| APPLICANT(S) FOR DO/EO/US<br><b>Paul Kunisch</b>   |  |   |   |
| Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:<br><br>1. <input checked="" type="checkbox"/> This is a <b>FIRST</b> submission of items concerning a filing under 35 U.S.C. 371.<br>2. <input type="checkbox"/> This is a <b>SECOND</b> or <b>SUBSEQUENT</b> submission of items concerning a filing under 35 U.S.C. 371.<br>3. <input checked="" type="checkbox"/> This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).<br>4. <input checked="" type="checkbox"/> A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.<br>5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371 (c) (2))<br>a. <input checked="" type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau).<br>b. <input type="checkbox"/> has been transmitted by the International Bureau.<br>c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US).<br>6. <input checked="" type="checkbox"/> A translation of the International Application into English (35 U.S.C. 371(c)(2)).<br>7. <input checked="" type="checkbox"/> A copy of the International Search Report (PCT/ISA/210).<br>8. <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))<br>a. <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau).<br>b. <input type="checkbox"/> have been transmitted by the International Bureau.<br>c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired.<br>d. <input checked="" type="checkbox"/> have not been made and will not be made.<br>9. <input type="checkbox"/> A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).<br>10. <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).<br>11. <input checked="" type="checkbox"/> A copy of the International Preliminary Examination Report (PCT/IPEA/409).<br>12. <input type="checkbox"/> A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).<br><br>Items 13 to 20 below concern document(s) or information included:<br>13. <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98.<br>14. <input checked="" type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.<br>15. <input checked="" type="checkbox"/> A <b>FIRST</b> preliminary amendment.<br>16. <input type="checkbox"/> A <b>SECOND</b> or <b>SUBSEQUENT</b> preliminary amendment.<br>17. <input type="checkbox"/> A substitute specification.<br>18. <input type="checkbox"/> A change of power of attorney and/or address letter.<br>19. <input checked="" type="checkbox"/> Certificate of Mailing by Express Mail<br>20. <input checked="" type="checkbox"/> Other items or information:<br><br><div style="border: 1px solid black; height: 100px; width: 100%;"></div> |  |   |   |

|   |                               |                          |
|---|-------------------------------|--------------------------|
| U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR 1.492(a)(1)-(5)) : | INTERNATIONAL APPLICATION NO. | ATTORNEY'S DOCKET NUMBER |
| 09/763348   | PCT/DE99/02513                | 0112740-153              |

|   |              |              |                          |                           |        |
|---|--------------|--------------|--------------------------|---------------------------|--------|
| 21. The following fees are submitted:   |              |              |                          | CALCULATIONS PTO USE ONLY |        |
| BASIC NATIONAL FEE ( 37 CFR 1.492 (a) (1) - (5)) :  |              |              |                          |                           |        |
| <input type="checkbox"/> Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO ..... \$1,000.00 |              |              |                          |                           |        |
| <input checked="" type="checkbox"/> International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO ..... \$860.00  |              |              |                          |                           |        |
| <input type="checkbox"/> International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO ..... \$710.00  |              |              |                          |                           |        |
| <input type="checkbox"/> International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4) ..... \$690.00   |              |              |                          |                           |        |
| <input type="checkbox"/> International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) ..... \$100.00   |              |              |                          |                           |        |
| ENTER APPROPRIATE BASIC FEE AMOUNT =  |              |              |                          | \$860.00                  |        |
| Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).  |              |              |                          | \$0.00                    |        |
| CLAIMS  | NUMBER FILED | NUMBER EXTRA | RATE                     |                           |        |
| Total claims  | 2 - 20 =     | 0            | x \$18.00                | \$0.00                    |        |
| Independent claims  | 1 - 3 =      | 0            | x \$80.00                | \$0.00                    |        |
| Multiple Dependent Claims (check if applicable) .   |              |              | <input type="checkbox"/> | \$0.00                    |        |
| TOTAL OF ABOVE CALCULATIONS =   |              |              |                          | \$860.00                  |        |
| Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28) (check if applicable) .  |              |              |                          | <input type="checkbox"/>  | \$0.00 |
| SUBTOTAL =  |              |              |                          | \$860.00                  |        |
| Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492 (f)).                                   |              |              |                          | +                         | \$0.00 |
| TOTAL NATIONAL FEE =  |              |              |                          | \$860.00                  |        |
| Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) (check if applicable).   |              |              |                          | <input type="checkbox"/>  | \$0.00 |
| TOTAL FEES ENCLOSED =   |              |              |                          | \$860.00                  |        |
|   |              |              |                          | Amount to be: refunded    | \$     |
|   |              |              |                          | charged                   | \$     |

- ☒ A check in the amount of \$860.00 to cover the above fees is enclosed.
- ☐ Please charge my Deposit Account No. 02-1818 in the amount of to cover the above fees.  
A duplicate copy of this sheet is enclosed.
- ☒ The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. 02-1818 A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

William E. Vaughan  
Bell, Boyd & Lloyd LLC  
P.O. Box 1135  
Chicago, IL 60690-1135

SIGNATURE

William E. Vaughan

NAME

39,056

REGISTRATION NUMBER

February 14, 2001

DATE

BOX PCT

IN THE UNITED STATES ELECTED/DESIGNATED OFFICE  
OF THE UNITED STATES PATENT AND TRADEMARK OFFICE  
UNDER THE PATENT COOPERATION TREATY-CHAPTER II

5

**PRELIMINARY AMENDMENT**

APPLICANT: Paul Kunisch DOCKET NO: 112740-153  
SERIAL NO: GROUP ART UNIT:  
EXAMINER:  
INTERNATIONAL APPLICATION NO: PCT/DE99/02513  
INTERNATIONAL FILING DATE: 11 August 1999  
INVENTION: A METHOD FOR OPTIMIZING THE TRANSMISSION  
PROPERTIES AND POWER LOSS OF A HIGH VOLTAGE  
PART INTEGRATED IN A SUBSCRIBER LINE CIRCUIT  
FOR CONNECTING A SUBSCRIBER LINE

Assistant Commissioner for Patents,  
Washington, D.C. 20231

Sir:

Please amend the above-identified International Application before entry  
into the National stage before the U.S. Patent and Trademark Office under 35 U.S.C.  
§371 as follows:

**In The Specification:**

On amended page 1, cancel lines 1-6 and substitute the following therefor:

**--S P E C I F I C A T I O N****TITLE**

A METHOD FOR OPTIMIZING THE TRANSMISSION PROPERTIES  
AND POWER LOSS OF A HIGH VOLTAGE PART INTEGRATED IN A  
SUBSCRIBER LINE CIRCUIT FOR CONNECTING A SUBSCRIBER  
LINE

**BACKGROUND OF THE INVENTION**

**Field of the Invention--.**

On amended page 1, line 8, insert --present-- before “invention”.

On amended page 1, line 10, insert --which is-- before “integrated”.

On amended page 1, lines 11-12, cancel “in accordance with the  
5 precharacterizing clause of patent claim 1” and substitute therefor --wherein  
telephone signals and data signals are amplified and measured for the purpose of  
further processing such that, ultimately, the data signals within the high voltage part  
are transmitted with a high bandwidth substantially without distortions and the power  
loss of the high voltage part is optimized--.

10 On amended page 1, before line 13, insert the following left-hand justified  
heading:

**--Description of the Prior Art--.**

On amended page 1, line 13, cancel “Accordingly, the invention relates to  
a” and substitute therefor --The above-referenced--.

15 On amended page 1, line 14, insert --is-- after “part”.

On amended page 1, line 22, insert --there is transmission of-- before “not”.

On amended page 1, line 24, cancel “, for example” and substitute therefor  
--(e.g.,--.

On amended page 1, line 25, insert a --)-- after “applications”.

20 On amended page 1, line 26, cancel the “,” after “signals”.

On amended page 1, line 26, insert a --(-- before “e.g.”.

On amended page 1, line 26, insert a --,-- after “e.g.”.

On amended page 1, line 26, insert a --)-- after “services”.

On amended page 1, line 26, cancel “are transmitted,”.

25 On amended page 1, line 30, insert a --,-- after “e.g.”.

On amended page 1, lines 31-32, cancel “, whereas” and substitute therefor  
--. Conversely,--.

On amended page 1a, line 1, cancel “Such an” and substitute therefor --  
This--.

On amended page 1a, line 1, cancel “the”.

On amended page 2, line 6, cancel “with” and substitute therefor --wherein-

-.

On amended page 2, line 7, cancel “extending” and substitute therefor --  
5 extends--.

On amended page 2, include the paragraph which begins on line 13 in the  
paragraph which ends on line 12.

On amended page 2, line 17, insert a --,-- after “e.g.”.

On amended page 2, line 23, insert --which-- after “and”.

10 On amended page 2, line 25, cancel “are”.

On amended page 2, line 35, cancel “which, above” and substitute therefor  
--. Above--.

On amended page 2, line 35, insert --These distortions-- before “have”.

On amended page 2a, line 1, cancel the “,” and substitute therefor a --;--.

15 On amended page 2a, line 1, insert a --,-- after “e.g.”.

On amended page 2a, line 17, cancel “and also of” and substitute therefor  
--or the--.

On amended page 2a, line 19, cancel “The” and substitute therefor --An--.

On amended page 2a, line 19, insert --present-- before “invention”.

20 On amended page 2a, line 19, insert a --,-- after “is”.

On amended page 2a, line 19, insert a --,-- after “therefore”.

On amended page 2a, lines 20-21, of the type specified in the  
precharacterizing clause of patent claim 1”.

On page 3, line 3, cancel “such”.

25 On page 3, cancel lines 7-10 and substitute the following centered heading  
therefor:

**--SUMMARY OF THE INVENTION--**

On page 3, line 11, cancel “According” and substitute therefor --Thus,  
according--.

On page 3, line 11, insert --present-- before "invention".

On page 3, line 14, insert --which-- before "supply".

On page 3, line 19, cancel "which are such that" and substitute therefor --  
wherein--.

5 On page 3, line 25, insert --present-- before "invention".

On page 3, line 28, cancel ", in which" and substitute therefor --. In this--.

On page 3, line 28, insert a --,-- after "state".

On page 3, line 31, cancel "and also".

On page 3, line 33, insert --present-- before "invention".

10 On page 4, cancel lines 3-5 and substitute the following therefor:

--Additional features and advantages of the present invention are described  
in, and will be apparent from, the following Detailed Description of the Preferred  
Embodiments and the Drawings.

#### **DESCRIPTION OF THE DRAWINGS--.**

15 On page 4, line 6, cancel "The figure" and substitute therefor --Figure 1--.

On page 4, before line 10, insert the following centered heading:

#### **--DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS--.**

On page 4, line 21, cancel "the figure by means of" and substitute therefor  
--Figure 1 via--.

20 On page 4, line 29, cancel ", and" and substitute therefor --. The A/D  
conversion unit also has the function--.

On page 4, line 35, cancel ", and these" and substitute therefor --. These--

On page 5, line 7, insert a --,-- after "sources".

On page 5, line 9, cancel "the figure" and substitute therefor --Figure 1--.

25 On page 5, line 12, cancel ", and these" and substitute therefor ---. These--.

On page 5, line 19, cancel the ",."

On page 5, line 33, cancel ", which means that" and substitute therefor --.

This results in--.

On page 5, line 34, cancel "can arise" and substitute therefor --arising--.

On page 6, line 2, cancel the “,”.

On page 6, line 22, insert --either-- after “lines”.

On page 6, line 23, cancel the “,”.

On page 6, line 23, insert a --,-- after “or”.

5 On page 6, line 23, insert a --,-- after “possibly”.

On page 6, line 25, cancel the “,” after “logic”.

On page 6, line 27, cancel “, as” and substitute therefor --. As--.

On page 6, line 28, cancel “of which” and substitute therefor a --,--.

On page 6, line 35, cancel the “,”.

10 On page 6, line 35, insert --, further,-- after “and”.

On page 7, after line 15, insert the following paragraph:

--Although the present invention has been described with reference to specific embodiments, those of skill in the art will recognize that changes may be made thereto without departing from the spirit and scope of the invention as set forth in the hereafter appended claims.--

15

On page 9 (last page), cancel lines 1-6, and substitute the following centered heading therefor:

**--ABSTRACT OF THE DISCLOSURE--**.

On page 9, line 8, cancel “During” and substitute therefor --A method for  
20 optimizing the transmission properties and power loss of a high voltage part  
integrated in a subscriber line circuit for connecting a subscriber line wherein,  
during--.

On page 9, line 8, cancel “a” and substitute therefor --the--.

On page 9, line 9, cancel “(HV) integrated in a subscriber line circuit”.

25 On page 9, line 9, cancel “the”.

On page 9, line 10, cancel “(SQ)”.

On page 9, line 11, insert --which-- before “supply”.

On page 9, line 12, cancel “(V)”.

On page 9, line 13, cancel “(S)”.

On page 9, line 13, cancel the “,”.

On page 9, line 14, insert a --(-- before “which”.

On page 9, line 15, insert a --)-- after “speech”.

On page 9, line 22, cancel the “,”.

5 On page 9, cancel line 25.

**In the Claims:**

On page 8, cancel line 1, and substitute the following left-hand justified heading therefor:

**--I Claim As Our Invention:--.**

10 Please cancel claims 1-2, without prejudice, and substitute the following claims therefor:

3. A method for optimizing transmission properties and power loss of a high voltage part, integrated in a subscriber line circuit for connecting a subscriber line, within a digital telephone exchange, the method comprising the steps of:

15 amplifying and supplying to the subscriber line, in the high voltage part and in a direction toward the subscriber line, both telephone signals and data signals, wherein the telephone signals are situated within a frequency band provided for speech and the data signals are situated in a frequency band above that provided for speech and can be transmitted at a high rate;

20 measuring both the telephone signals, situated within the frequency band provided for speech and coming from the subscriber line, and the data signals, situated in a frequency band above that provided for speech, for the purpose of further processing; and

25 setting current sources, which are integrated in the high voltage part and which supply current to units present in the high voltage part, the current determining operating point settings of the units, for one of amplifying and measuring the telephone and data signals, no later than when the data signals are received in the high voltage part, to current values which are higher than current values for exclusive



transmission of the telephone signals situated within the frequency band provided for speech, wherein the data signals within the high voltage part are transmitted with a high bandwidth substantially without distortions, and the power loss of the high voltage part is optimized.

5

4. A method for optimizing transmission properties and power loss of a high voltage part as claimed in claim 3, the method further comprising the step of:

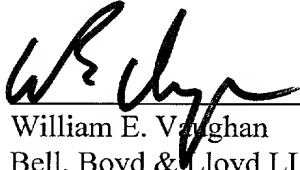
supplying, via the current sources, each of the units present in the high voltage part only with current required for quiescent operation of the units if neither  
10 data signals nor telephone signals are being transmitted in the high voltage part.

#### REMARKS

The present amendment makes editorial changes and corrects typographical errors in the specification in order to conform the specification to the requirements  
15 of the United States Patent practice. No new matter is added thereby. Original claims 1-2 have been canceled in favor of new claims 3-4. Claims 3-4 have been presented solely because the revisions by bracketing and underlining which would have been necessary in claims 1-2 in order to present those claims in accordance with preferred United States Patent practice would have been too extensive, and thus  
20 would have been too burdensome. The amendment is intended for clarification purposes only and not for substantial reasons related to patentability pursuant to 35 U.S.C. §§101, 102, 103 or 112. Indeed, the cancellation of claims 1-2 does not constitute an intent on the part of the Applicant to surrender any of the subject matter of claims 1-2.

Early consideration on the merits is respectfully requested.

Respectfully submitted,



(Reg. No. 39,056)

William E. Vaughan  
Bell, Boyd & Lloyd LLC  
P.O. Box 1135  
Chicago, Illinois 60690-1135  
(312) 807-4292  
Attorneys for Applicant

## Description

Method for optimizing the transmission properties and power loss of a high voltage part integrated in a subscriber line circuit for connecting a subscriber line

The invention relates to a method for optimizing the transmission properties and power loss of a high voltage part, integrated in a subscriber line, within a digital telephone exchange in accordance with the precharacterizing clause of patent claim 1.

Accordingly, the invention relates to a high voltage part integrated in a subscriber line circuit for connecting a subscriber line in the form of a two-wire copper line on which not only telephone signals, which are situated within a frequency band provided for speech, for example telephone signals produced by speech, fax or modem applications, but also data signals, e.g. for multimedia services, are transmitted, whose frequency band is situated above the frequency band provided for speech. In this context, such data signals coming from the subscriber line circuit are transmitted at a high rate (e.g. 1.5 Mbit/s, 2 Mbit/s or 6 Mbit/s) within a broadband transmission channel, whereas in the direction toward the subscriber line circuit, such data signals are generally transmitted at a low data rate.

Such an increase in the bandwidth of such subscriber lines in the form of two-wire copper lines is made possible by so-called XDSL technology (Digital Subscriber Line), a new type of transmission method for high-speed data transmission over the customary two-wire copper lines of a telephone network. To prevent analog telephone signals and the XDSL data signals from influencing one another, the latter occupy a frequency band which is situated above the frequency band provided

for speech, with the frequency band available for XDSL data transmission extending, by way of example, up to 552 kHz or 1.1 MHz.

5 In the context of setting up Internet access for subscriber terminals belonging to subscribers to the conventional telephone network, XDSL technology is currently becoming increasingly important.

10 For the XDSL method, the switching side of a subscriber line circuit contains devices for isolating and combining telephone signals and data signals and also devices for a modulation method used in this context (e.g. DMT, CAP, QAM).

15 Such a subscriber line circuit also integrates a high voltage part in which, in the direction toward the subscriber line circuit, not only the aforementioned conventional telephone signals but also the data signals, which are situated in a frequency band above that provided for speech and can be transmitted at a high rate using XDSL technology, are amplified and are supplied to the subscriber line. In the opposite direction, the telephone signals and the data signals, which are situated in a frequency band above that provided for speech and can be transmitted using XDSL technology, are measured for the purposes of subsequent A/D conversion.

20 During XDSL data transmission within such a high voltage part, the oscillation curve profile of the analog data signals situated within this high frequency band contains intense nonlinear distortions through the zero point which, above all, have an adverse effect on the bandwidth and further processing, e.g. in the form of A/D conversion and decoding of the data signals.

30 The object of the invention is therefore to devise a method of the type specified in the precharacterizing clause of patent claim 1

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such that the data signals, which are situated above the frequency band provided for speech, are transmitted in such a high voltage part with as little distortion as possible and with the highest bandwidth possible, and at the same time the power loss of the high voltage part is optimized.

This object is achieved by the features specified in the characterizing part of claim 1. A further embodiment of the invention is characterized in a dependent claim.

According to the invention, the transmission properties of such a high voltage part are optimized by virtue of the fact that current sources which are integrated in the high voltage part and supply current to the units present in the high voltage part for the purpose of amplifying or measuring telephone and data signals are set, no later than when such data signals are received in the high voltage part, to current values which are such that the data signals within the high voltage part are transmitted with a high bandwidth largely without distortions. In this context, the current values to be set are above the current values for exclusive transmission of telephone signals situated within the frequency band provided for speech.

The method according to the invention is thus used, without any additional hardware complications, to put the high voltage part into a state which is ideal for XDSL data transmission, in which state the occurrence of distortions at the zero point of such data signals' oscillation curve profile is prevented, and also the bandwidth is increased and the power loss of the high voltage part is optimum.

In an advantageous embodiment of the invention, if neither data signals nor telephone signals are being transmitted in the high voltage part, such current sources supply each of the units present in the high voltage part only with current required for their quiescent operation. This puts the high

voltage part into a so-called quiescent state with minimum power loss.

An illustrative embodiment of the invention is explained in more detail below with reference to a drawing.

The figure shows a high voltage part HV integrated in a subscriber line circuit for connecting a subscriber line TL, with a downstream-connected A/D conversion unit C, including its control unit ST.

A subscriber line TL in the form of a two-wire copper line a, b leads into the high voltage part. In the high voltage part, there is a respective connection to a current/voltage sensor S from wire a of the copper line and from wire b of the copper line. From the current/voltage sensor S, the two connections continue to the A/D conversion unit C.

In the opposite direction, two connections run from the A/D conversion unit to respective units having an amplification function, which are situated in the high voltage part. These units having an amplification function are indicated in the figure by means of the amplifiers V with respective resistors W connected in parallel and in series. The path of the aforementioned connections finally ends in the wires a, b at the output of the high voltage part.

The A/D conversion unit has the function of converting the analog telephone and data signals coming from the high voltage part into digital telephone and data signals, and of offloading these telephone and data signals, in each case separately, onto an outgoing line provided for telephone signals and onto an outgoing line provided for data signals.

In the opposite direction, the A/D conversion unit receives digital telephone signals and data signals via respective dedicated lines, and these signals are converted into analog telephone and data

signals and are transmitted in the direction of the amplifiers. Integrated in the A/D conversion unit is a control unit ST from which lines for control signals emerge and, at one end, lead away from the A/D conversion unit and, at the other end, lead to control logic STL integrated in the high voltage part. The control logic is connected to current sources which are integrated in the high voltage part and are indicated by SQ in the figure, and carries out setting for the current sources. Running from the current sources are a respective line to each of the amplifiers V and a line to the current/voltage sensor S, and these lines are used by the current sources to supply current to the amplifiers and to the current/voltage sensor.

During XDSL data transmission, data signals from the wires a, b are received in the current/voltage sensor S, where their current and voltage amplitude values are determined. From there, the data signals enter the A/D conversion unit C, which carries out A/D conversion on the analog data signals and sends the digital data signals obtained from A/D conversion to the outgoing lines for data signals. The control unit integrated in the A/D conversion unit records the received data signals in the A/D conversion unit and reports this to the control logic in the high voltage part. The control logic then sets the current sources to the current values and operating points ideal for XDSL data transmission, which are above the current values for exclusive transmission of telephone signals. The fact that the current/voltage sensor is supplied with a higher current value by the voltage sources changes the transfer function in the current/voltage sensor, which means that virtually no nonlinear distortions can arise in the data signals.

As an alternative to this, before the XDSL data signals are transmitted, a so-called wakeup signal can be sent from outside in the direction of the high voltage part, entering the high voltage part via the



wires a, b. From the high voltage part, the wakeup signal is forwarded to the A/D conversion unit, in which the control unit records the wakeup signal and reports this to the control logic. Accordingly, the control logic sets the current sources to the current values and operating points which are ideal for the XDSL data transmission which is still imminent. This allows the high voltage part to be put into the ideal operating state for XDSL data transmission with optimum power loss even before XDSL data transmission starts.

In the opposite direction, digital telephone and data signals are received in the A/D conversion unit via their lines. In the A/D conversion unit, the D/A conversion is carried out on the telephone and data signals. The analog telephone and data signals obtained are sent in the direction of the high voltage part. In the high voltage part, the telephone and data signals are amplified by the amplifiers and are supplied to the wires a, b.

Before XDSL data transmission is initiated, the control unit in the A/D conversion unit monitors the incoming data signal lines for any incoming digital data signals, or possibly for a wakeup signal. Reception of such data signals or of the wakeup signal is reported to the control logic, which, in turn, sets the current sources to the current values and operating points which are ideal for XDSL data transmission, as a result of which the high voltage part is put into the ideal operating state for XDSL data transmission with optimum power loss. The current sources' current values, which are higher than the current values for exclusive transmission of telephone signals, have an effect on the nonlinearities and the bandwidth of the amplifiers. This allows the amplification-related distortions in the data signals to be prevented, and allows the bandwidth to be increased.

When XDSL data transmission has ended, i.e. when data signals are received in the A/D conversion unit neither from the high voltage part

nor via the lines for data signals, this circumstance is recorded by the control unit and a message is passed on to the control logic. The control logic resets the current values of the current source accordingly. The

5 setting of the current values is dependent on whether or not telephone signals are still being transmitted. For the case in which only telephone signals are being transmitted, the current values are set such that the high voltage part is put into a state suitable for pure

10 telephone signal transmission. If no telephone or data signals at all are being transmitted, current values required for the quiescent state of the units present in the high voltage part are set so that the high voltage part changes over to a quiescent mode with

15 minimum power loss.

## Patent Claims

1. A method for optimizing the transmission properties and power loss of a high voltage part (HV),  
5 integrated in a subscriber line circuit for connecting a subscriber line (TL), within a digital telephone exchange, where, in the high voltage part, in the direction toward the subscriber line, not only telephone signals, which are situated within a  
10 frequency band provided for speech, but also data signals, which are situated in a frequency band above that provided for speech and can be transmitted at a high rate, are amplified and are supplied to the subscriber line, and where telephone signals, situated  
15 within the frequency band provided for speech, coming from the subscriber line and also data signals, situated in a frequency band above that provided for speech, are measured for the purposes of further processing,  
20 characterized in that current sources (SQ) which are integrated in the high voltage part and supply quiescent current to the units present in the high voltage part for the purpose of amplifying (V) or measuring (S) such telephone and/or data signals are  
25 set, no later than when such data signals are received in the high voltage part, to current values which are higher than the current values for exclusive transmission of telephone signals situated within the frequency band provided for speech, such that the data  
30 signals within the high voltage part are transmitted with a high bandwidth largely without distortions, and the power loss of the high voltage part is optimized.
2. The method as claimed in claim 1,  
35 characterized in that, if neither data signals nor telephone signals are being transmitted in the high voltage part, such current sources supply each of the units present in the high voltage part only with current required for their quiescent operation.

## Abstract

Method for optimizing the transmission properties and power loss of a high voltage part integrated in a subscriber line circuit for connecting a subscriber line

During XDSL data transmission in a high voltage part (HV) integrated in a subscriber line circuit, the current sources (SQ) which are integrated in the high voltage part and supply current to the units present in the high voltage part for the purpose of amplifying (V) or measuring (S) telephone signals and/or data signals, which are situated above the frequency band provided for speech, are set, no later than when such data signals are received in the high voltage part, to current values which are higher than the current values for exclusive transmission of telephone signals situated within the voice band provided for speech, such that the data signals within the high voltage part are transmitted with a high bandwidth largely without distortions, and the power loss of the high voltage part is optimized.

Figure

## Description

Method for optimizing the transmission properties and power loss of a high voltage part integrated in a subscriber line circuit for connecting a subscriber line

The invention relates to a method for optimizing the transmission properties and power loss of a high voltage part, integrated in a subscriber line, within a digital telephone exchange in accordance with the precharacterizing clause of patent claim 1.

Accordingly, the invention relates to a high voltage part integrated in a subscriber line circuit for connecting a subscriber line in the form of a two-wire copper line. Such a high voltage part is disclosed, by way of example, in the article "A 150 V Subscriber Line Interface Circuit (SLIC) in a new BiCMOS/DMOS - Technology" by Zojer B. et al., Meeting, US, New York, IEEE 1996, pp. 93-96, ISBN: 0-7803-3517-1. On the two-wire copper line leading to the high voltage part, not only telephone signals, which are situated within a frequency band provided for speech, for example telephone signals produced by speech, fax or modem applications, but also data signals, e.g. for multimedia services, are transmitted, whose frequency band is situated above the frequency band provided for speech. In this context, such data signals coming from the subscriber line circuit are transmitted at a high rate (e.g. 1.5 Mbit/s, 2 Mbit/s or 6 Mbit/s) within a broadband transmission channel, whereas in the direction toward the subscriber line circuit, such data signals are generally transmitted at a low data rate.

[illegible]

high-speed data transmission over the customary two-wire copper lines of a telephone network. To prevent analog telephone signals and the XDSL data signals from influencing one another, the latter occupy a frequency  
5 band which is situated above the frequency band provided for speech, with the frequency band available for XDSL data transmission extending, by way of example, up to 552 kHz or 1.1 MHz.

In the context of setting up Internet access  
10 for subscriber terminals belonging to subscribers to the conventional telephone network, XDSL technology is currently becoming increasingly important.

For the XDSL method, the switching side of a subscriber line circuit contains devices for isolating  
15 and combining telephone signals and data signals and also devices for a modulation method used in this context (e.g. DMT, CAP, QAM).

Such a subscriber line circuit also integrates a high voltage part in which, in the direction toward  
20 the subscriber line circuit, not only the aforementioned conventional telephone signals but also the data signals, which are situated in a frequency band above that provided for speech and can be transmitted at a high rate using XDSL technology, are  
25 amplified and are supplied to the subscriber line. In the opposite direction, the telephone signals and the data signals, which are situated in a frequency band above that provided for speech and can be transmitted using XDSL technology, are measured for the purposes of  
30 subsequent A/D conversion.

During XDSL data transmission within such a high voltage part, the oscillation curve profile of the analog data signals situated within this high frequency band contains intense nonlinear distortions through the  
35 zero point which, above all, have an adverse



effect on the bandwidth and further processing, e.g. in the form of A/D conversion and decoding of the data signals.

5 In the context of XDSL technology, HDSL technology (high bit rate digital subscriber line) is known, for example. The article "Saving Dynamic Power In HDSL Line Driving Applications" by Nash E., Electronic Design, US, Penton Publishing, Cleveland, OH, Vol. 45, No. 12, June 9, 1997 (1997-06-09), pages  
10 88, 90, 92, XP000731500, ISSN: 0013-4872 describes a circuit for an HDSL line driver which is of optimum design in terms of its power loss and distortions in the high bit rate data signals. This article does not  
15 able to satisfy the exchange-side requirements of optimum transmission of pure telephone signals or pure data signals, and also of possible simultaneous transmission of telephone signals and data signals.

The object of the invention is therefore to  
20 devise a method of the type specified in the precharacterizing clause of patent claim 1

Patent Claims

1. A method for optimizing the transmission properties and power loss of a high voltage part (HV),  
5 integrated in a subscriber line circuit for connecting a subscriber line (TL), within a digital telephone exchange, where, in the high voltage part, in the direction toward the subscriber line, not only telephone signals, which are situated within a  
10 frequency band provided for speech, but also data signals, which are situated in a frequency band above that provided for speech and can be transmitted at a high rate, are amplified and are supplied to the subscriber line, and where telephone signals, situated  
15 within the frequency band provided for speech, coming from the subscriber line and also data signals, situated in a frequency band above that provided for speech, are measured for the purposes of further processing,  
20 characterized in that current sources (SQ) which are integrated in the high voltage part and supply current to the units present in the high voltage part, said current determining the operating point settings of said units, for the purpose of amplifying (V) or  
25 measuring (S) such telephone and/or data signals are set, no later than when such data signals are received in the high voltage part, to current values which are higher than the current values for exclusive transmission of telephone signals situated within the  
30 frequency band provided for speech, such that the data signals within the high voltage part are transmitted with a high bandwidth largely without distortions, and the power loss of the high voltage part is optimized.
2. The method as claimed in claim 1,  
35 characterized in that, if neither data signals nor telephone signals are being transmitted in the high

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voltage part, such current sources supply each of the units present in the high voltage part only with current required for their quiescent operation.

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(71) Anmelder (für alle Bestimmungsstaaten ausser US): SIEMENS  
AKTIENGESELLSCHAFT [DE/DE]; Wittelsbacherplatz 2,  
D-80333 München (DE).

(72) Erfinder; und

(75) Erfinder/Anmelder (nur für US): KUNISCH, Paul [DE/DE];  
Rotwandstrasse 16, D-82178 Puchheim (DE).(74) Gemeinsamer Vertreter: SIEMENS AKTIENGE-  
SELLSCHAFT; Postfach 22 16 34, D-80506 München  
(DE).(81) Bestimmungsstaaten: US, europäisches Patent (AT, BE, CH,  
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Veröffentlicht

Mit internationalem Recherchenbericht.

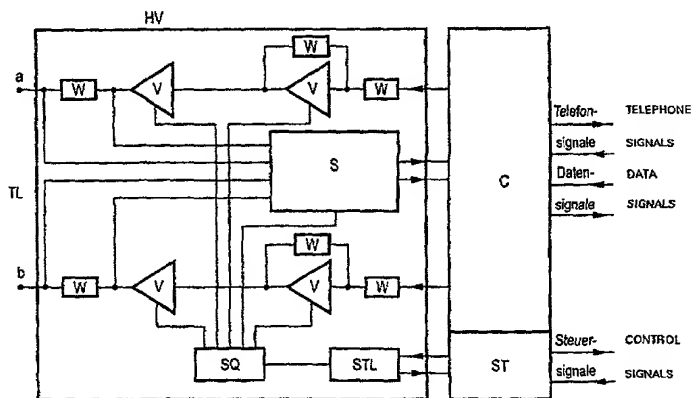
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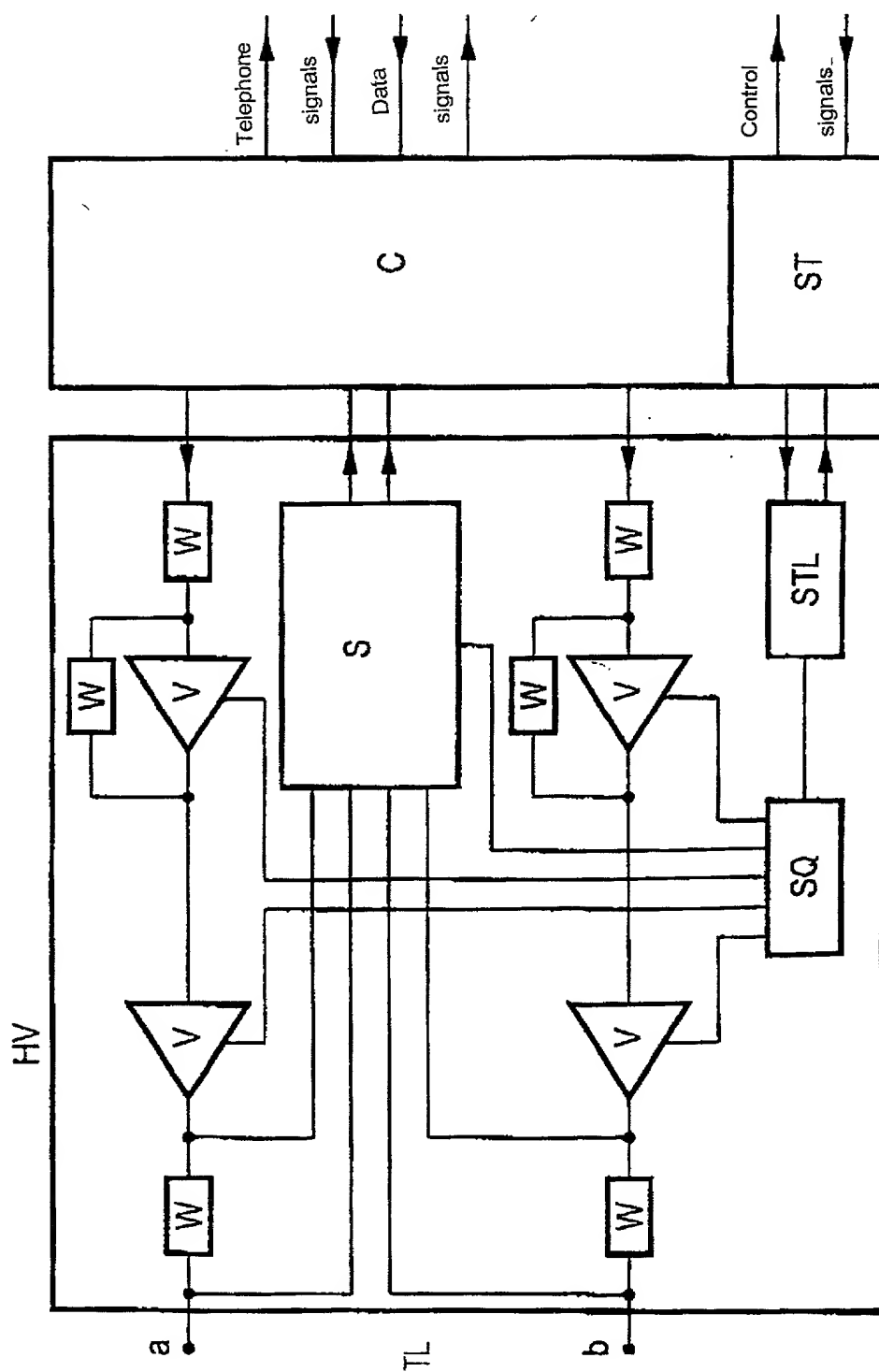
(54) Title: METHOD FOR OPTIMIZING THE TRANSMISSION PROPERTIES AND THE POWER LOSS OF A HIGH-VOLTAGE  
PART WHICH IS INTEGRATED IN A SUBSCRIBER CONNECTION CIRCUIT FOR CONNECTING A SUBSCRIBER  
CONNECTION LINE(54) Bezeichnung: VERFAHREN ZUR OPTIMIERUNG DER ÜBERTRAGUNGSEIGENSCHAFTEN UND DER VERLUSTLEIS-  
TUNG EINES IN EINE TEILNEHMERANSCHLUSSSCHALTUNG ZUM ANSCHLUSS EINER TEILNEHMER-  
ANSCHLUSSLEITUNG INTEGRIERTEN HOCHVOLTTEILS

## (57) Abstract

During an XDSL data transmission in a high-voltage part (HV) integrated in a subscriber connection circuit, the current sources (SQ) which are integrated in the high-voltage part and which supply the physical units with current are adjusted to current values. The physical units are located in the high-voltage part and are provided for amplifying (V) or measuring (S) telephone signals and/or data signals located above the frequency band provided for speech. The current sources are, at the latest, set when digital signals of the aforementioned type are received in the high-voltage part. Said current values deviate upward with regard to the current values during the exclusive transmission of telephone signals located within the speech band provided for speech. These current values deviate in such a way that the data signals are transmitted with a higher bandwidth inside the high-voltage part and, for the most part, without distortions, and the power loss of the high-voltage part is optimized.



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# Declaration and Power of Attorney For Patent Application

## *Erklärung Für Patentanmeldungen Mit Vollmacht*

### German Language Declaration

Als nachstehend benannter Erfinder erkläre ich hiermit an Eides Statt:

dass mein Wohnsitz, meine Postanschrift, und meine Staatsangehörigkeit den im Nachstehenden nach meinem Namen aufgeführten Angaben entsprechen,

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Verfahren zur Optimierung der  
Übertragungseigenschaften und der  
Verlustleistung eines in eine  
Teilnehmeranschlussschaltung zum  
Anschluss einer  
Teilnehmeranschlussleitung integrierten  
Hochvolteils

deren Beschreibung

(zutreffendes ankreuzen)

☒ hier beigelegt ist.

☐ am \_\_\_\_\_ als

PCT internationale Anmeldung

PCT Anwendungsnummer \_\_\_\_\_

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Ich bestätige hiermit, dass ich den Inhalt der obigen Patentanmeldung einschliesslich der Ansprüche durchgesehen und verstanden habe, die eventuell durch einen Zusatzantrag wie oben erwähnt abgeändert wurde.

Ich erkenne meine Pflicht zur Offenbarung irgendwelcher Informationen, die für die Prüfung der vorliegenden Anmeldung in Einklang mit Absatz 37, Bundesgesetzbuch, Paragraph 1.56(a) von Wichtigkeit sind, an.

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As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

the specification of which

(check one)

☐ is attached hereto.

☐ was filed on \_\_\_\_\_ as

PCT international application

PCT Application No. \_\_\_\_\_

and was amended on \_\_\_\_\_

(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

## German Language Declaration

Prior foreign applications  
Priorität beansprucht

Priority Claimed

198 36 958.1 Germany

14. August 1998

(Number) (Country)  
(Nummer) (Land)

(Day Month Year Filed)  
(Tag Monat Jahr eingereicht)

☒

☐

Yes  
Ja

No  
Nein

(Number) (Country)  
(Nummer) (Land)

(Day Month Year Filed)  
(Tag Monat Jahr eingereicht)

☐

☐

Yes  
Ja

No  
Nein

(Number) (Country)  
(Nummer) (Land)

(Day Month Year Filed)  
(Tag Monat Jahr eingereicht)

☐

☐

Yes  
Ja

No  
Nein

Ich beanspruche hiermit gemäss Absatz 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 120, den Vorzug aller unten aufgeführten Anmeldungen und falls der Gegenstand aus jedem Anspruch dieser Anmeldung nicht in einer früheren amerikanischen Patentanmeldung laut dem ersten Paragraphen des Absatzes 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 122 offenbart ist, erkenne ich gemäss Absatz 37, Bundesgesetzbuch, Paragraph 1.56(a) meine Pflicht zur Offenbarung von Informationen an, die zwischen dem Anmeldedatum der früheren Anmeldung und dem nationalen oder PCT internationalen Anmeldedatum dieser Anmeldung bekannt geworden sind.

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §122, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application.

(Application Serial No.)  
(Anmeldeseriennummer)

(Filing Date)  
(Anmeldedatum)

(Status)  
(patentiert, anhängig,  
aufgegeben)

(Status)  
(patented, pending,  
abandoned)

(Application Serial No.)  
(Anmeldeseriennummer)

(Filing Date)  
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POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. (list name and registration number)

And I hereby appoint

Messrs. William E. Vaughan (Reg. No. 39,056); Robert M. Barrett (Reg. No. 30,142); Michael S. Leonard (Reg. No. 37,557); Patricia A. Kane (Reg. No. 46,446); Thomas C. Basso (Reg. No. 46,541); Robert W. Connors (Reg. No. 46,442); Troy A. Groetren (Reg. No. 46,442); Adam H. Masia (Reg. No. 35,602); Dante J. Picciano (Reg. No. 33,543); Amy J. Gast (Reg. No. 41,773); Timothy L. Harney (Reg. No. 38,174); Renato L. Smith (Reg. No. 45,117); and Alan L. Barry (Reg. No. 30,819)

Telefongespräche bitte richten an:  
(Name und Telefonnummer)

Direct Telephone Calls to: (name and telephone number)

(312) 807-4292  
Ext. \_\_\_\_\_

Postanschrift:

Send Correspondence to:

William E. Vaughan  
Bell, Boyd & Lloyd  
P.O. Box 1135  
Chicago, IL 60690-1135

|  |                         |   |      |
|--|-------------------------|---|------|
| Voller Name des einzigen oder ursprünglichen Erfinders:  |                         | Full name of sole or first inventor:        |      |
| KUNISCH, Paul  |                         |   |      |
| Unterschrift des Erfinders                               | Datum                   | Inventor's signature                        | Date |
| <i>Paul Kunisch</i>                                      | <i>January 29, 2001</i> |   |      |
| Wohnsitz   |                         | Residence                                   |      |
| D-82178 Puchheim, Germany                                |                         |   |      |
| Staatsangehörigkeit                                      |                         | Citizenship                                 |      |
| Bundesrepublik Deutschland                               |                         |   |      |
| Postanschrift  |                         | Post Office Address                         |      |
| Rotwandstr. 16   |                         |   |      |
| D-82178 Puchheim   |                         |   |      |
| Bundesrepublik Deutschland                               |                         |   |      |
| Voller Name des zweiten Miterfinders (falls zutreffend): |                         | Full name of second joint inventor, if any: |      |
|  |                         |   |      |
| Unterschrift des Erfinders                               | Datum                   | Second Inventor's signature                 | Date |
|  |                         |   |      |
| Wohnsitz   |                         | Residence                                   |      |
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| Staatsangehörigkeit                                      |                         | Citizenship                                 |      |
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(Bitte entsprechende Informationen und Unterschriften im Falle von dritten und weiteren Miterfindern angeben).

(Supply similar information and signature for third and subsequent joint inventors).